



12 Pages

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
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Complete, fold and seal
(see note 2 below)

SURNAME: Hughes

FORENAME(S): Tewan

Paul

1	Student Number	1708442
2	Title of Examination Paper	Mathematics Test 1
3	Module Code	N4X00391
4	Date and Time of Examination	10/01/2018 14:00
5	Examination Venue	H.N House IT 2 Lower college
6	Seat Number	3
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1	
3	
Q1 a	7
b	1
c	14
d	4
e	1
Q3 a	21
b	4
c	3
d	6
e	1
Office Use	62/80

Test 1

✓
✓
✓
✓
✓

✓
✓
✓
✓

77.5%

ai $\frac{4}{2x+1} = \frac{5}{x-1}$

$$4(x-1) = 5(2x+1) \quad \checkmark \quad \textcircled{1}$$

$$4x-4 = 10x+5 \quad \checkmark$$

$$-5-4 = 10x-4x$$

$$-9 = 6x \quad \checkmark$$

$$x = \frac{-9}{6} \quad \checkmark$$

$$x = -1.5 \quad \checkmark \quad \textcircled{2}$$

ii $\frac{(x+2)}{6} - \frac{(2x+3)}{3} = \frac{x}{12}$

$$12 \left(\frac{x+2}{6} - \frac{(2x+3)}{3} \right) = \frac{x}{12} \quad \checkmark \quad \textcircled{1}$$

$$6 \left(\frac{12x+24}{2} - \frac{12x+36}{6} \right) = 2x \quad \times$$

$$\frac{72x+144}{3} - \quad \times$$

iii $2^{x+1} = 5^x \times 3$

$$\log(2^{x+1}) = \log(5^x \times 3) \quad \checkmark \quad \textcircled{1}$$

$$(x+1)\log(2) = x\log(5) + \log(3) \quad \textcircled{1}$$

$$(x+1)0.3 = (x)0.69 + 0.477 \quad \textcircled{1}$$

$$0.3x + 0.3 = 0.69x + 0.477 \quad \checkmark$$

$$0.3 - 0.477 = 0.69x - 0.3x$$

$$-0.177 = 0.39x$$

$$x = \frac{-0.177}{0.39}$$

$$x = -0.45 \quad \checkmark \quad \textcircled{2}$$

iv)

?

0

✓

b.

$$2V = \frac{P+Q}{3P-T}$$

$$2V(3P-T) = P+Q$$

$$3P-T = \frac{P+Q}{2V}$$

$$3P = \frac{P+Q}{2V} + T$$

$$P = \left(\frac{P+Q}{2V} + T \right) \div 3$$

$$P =$$

1

✓

C.
i

$$2x^2 + 11x + 12 = 0$$

$$\underline{2x^2 + 8x + 3x + 12 = 0}$$

$$2 \times 12$$

$$1 \times 24$$

$$4 \times 6$$

$$3 \times 8$$

$$2x(x+4)3(x+4) = 0$$

$$2x+3=0 \text{ or } 3x+4=0$$

$$2x=-3 \quad (2)$$

$$x = -\frac{3}{2} \quad \checkmark$$

$$x = -1.5 \text{ or } x = -4 \quad (2) \quad \checkmark$$

4
✓

4

ii

$$x^2 - 28 = 3x$$

$$x^2 - 3x - 28 = 0 \quad \checkmark \quad (1)$$

$$\underline{x^2 + 4x - 7x - 28 = 0}$$

$$1 \times 28$$

$$2 \times 14$$

$$7 \times 4$$

$$x(x+4) - 7(x+4) = 0$$

$$x-7=0 \text{ or } x+4=0 \quad (2)$$

$$x=7 \quad \checkmark \text{ or } x=-4 \quad \checkmark \quad (2)$$

4
✓

iii

$$-4 = -x - 3x^2$$

$$3x^2 + x - 4 = 0 \quad \checkmark \quad (1)$$

$$\underline{3x^2 + 4x - 3x - 4 = 0}$$

$$3 \times 4$$

$$1 \times 12$$

$$2 \times 6$$

$$\underline{3x^2 + 4x - 3x - 4 = 0}$$

$$x(3x+4) - 1(3x+4) = 0$$

$$x-1=0 \text{ or } 3x+4=0 \quad (2)$$

$$x=1 \quad \checkmark \quad 3x=-4$$

$$x = -\frac{4}{3} \quad \checkmark \quad (2)$$

$$x = -1.5 \quad \checkmark$$

5
✓

d

$$5T^2 + 16T + 3$$

$$\underline{5T^2 + 15T + T + 3 = 0}$$

$$3 \times 5$$

$$1 \times 15$$

$$T(5T+1)3(5T+1) = 0$$

$$(T+3)(5T+1) \quad \checkmark \quad (1)$$

4
✓

12)

$$\begin{aligned}
 & \cancel{T+3} = 0 \quad \text{or} \quad \cancel{5T+1} = 0 \\
 & \cancel{T+3} = 3 \quad \quad \quad \cancel{5T} = -1 \quad \quad \quad (\cancel{T+3}) (\cancel{5T+1}) \\
 & \quad \quad \quad \cancel{T} = \frac{-1}{5} \\
 & \quad \quad \quad \cancel{T} = \frac{-1}{5}
 \end{aligned}$$

ii $U^2 - 4F^2$

$$(U + 2F)(U - 2F) \quad \checkmark \quad \textcircled{1}$$

iii $\frac{xy - xr + ty - tr}{x(y-r) + t(y-r)}$

$$x(y-r) + t(y-r)$$

$$(x+t)(y-r) \quad \checkmark \quad \textcircled{2}$$

e. $x=2 \quad x=-3$

$$x-2=0 \quad x+3=0 \quad \checkmark \quad \textcircled{1}$$

$$(x-2)(x+3) \quad \checkmark \quad \textcircled{2}$$

$$x^2 + 3x - 2x - 6 \quad \checkmark \quad \textcircled{2}$$

$$y = x^2 + 3x - 2x - 6$$

a.

$$i. y = 5x^4 + 3x^2 - x + 1$$

$$\frac{dy}{dx} = 20x^3 + 6x - 1$$

ii.

$$y = (2x+3)^2$$

$$u = 2x+3$$

$$y = u^2$$

$$\frac{dy}{du} = 2u$$

$$\frac{du}{dx} = 2$$

$$\frac{dy}{dx} = 2u \cdot 2 = 4u = 4(2x+3)$$

iii.

$$y = x\sqrt{x} + \frac{2}{\sqrt[3]{x}}$$

$$y = x \cdot x^{\frac{1}{2}} + 2x^{-\frac{1}{3}}$$

$$y = x^{1.5} + 2x^{-\frac{1}{3}}$$

$$\frac{dy}{dx} = 1.5x^{\frac{1}{2}} - 0.6x^{-\frac{4}{3}}$$

$$\frac{dy}{dx} = 1.5x^{0.5} - 0.6x^{-1.3}$$

iv.

$$y = \sin 2x - 3\cos 4x - \tan \frac{x}{2}$$

$$\frac{dy}{dx} = 2\cos 2x + 12\sin 4x - \frac{1}{2}\sec^2 \frac{x}{2}$$

V. $y = \frac{\sin 5x}{e^{2x} + 3x^2}$ $\begin{matrix} u \\ v \end{matrix}$

$$u = \sin 5x \quad \checkmark$$

$$v = e^{2x} + 3x^2 \quad \checkmark$$

$$\frac{du}{dx} = 5 \cos 5x \quad \checkmark \text{ ①}$$

$$\frac{dv}{dx} = 2e^{2x} + 6x \quad \checkmark \text{ ①}$$

$$v^2 = (e^{2x} + 3x^2)^2 \quad \checkmark$$

$$\frac{dy}{dx} = \frac{(e^{2x} + 3x^2)(5 \cos 5x) - \sin 5x(2e^{2x} + 6x)}{(e^{2x} + 3x^2)^2}$$

vi $y = \sqrt[3]{6x^3 - 2x + 1}$

$$y = (6x^3 - 2x + 1)^{\frac{1}{3}}$$

$$y = u^{\frac{1}{3}}$$

$$\frac{dy}{du} = \frac{1}{3} u^{-\frac{2}{3}}$$

$$\frac{du}{dx} = 18x^2 - 2$$

$$\frac{dy}{dx} = \frac{1}{3} u^{-\frac{2}{3}} \cdot (18x^2 - 2)$$

$$\frac{dy}{dx} = \frac{1}{3} (6x^3 - 2x + 1)^{-\frac{2}{3}} \cdot (18x^2 - 2)$$

vii $y = 3x^2 \ln x$ $\begin{matrix} v \\ u \end{matrix}$

$$u = \ln x$$

$$v = 3x^2$$

$$\frac{du}{dx} = \frac{1}{x} \quad \checkmark \text{ ①}$$

$$\frac{dv}{dx} = 6x \quad \checkmark$$

$$\frac{dy}{dx} = \ln x(6x) + 3x^2\left(\frac{1}{x}\right)$$

b. $4x^2 + 3x - 5$

$$\frac{dy}{dx} = 8x + 3 \quad \checkmark \quad (1)$$

$$\frac{d^2y}{dx^2} = 8 \quad \checkmark \quad (1)$$

$$3(8) + 2(8x + 3) - 30 - 16x = 0 \quad \checkmark \quad (1)$$

$$24 + 16x + 6 - 30 - 16x = 0$$

$$16x - 16x = 30 - 24 - 6$$

$$0 = 0$$

Therefore $3\left(\frac{d^2y}{dx^2}\right) + 2\left(\frac{dy}{dx}\right) - 30 - 16x = 0$

4
✓

c. $y = \sin 2x$

$$\frac{dy}{dx} = 2\cos 2x \quad \checkmark$$

$$\frac{d^2y}{dx^2} = -4\sin 2x \quad \checkmark \quad (1)$$

$$\frac{d^3y}{dx^3} = -8\cos 2x \quad \checkmark \quad (1)$$

$$\frac{d^4y}{dx^4} = 16\sin 2x \quad \checkmark \quad (1)$$

3
✓

d.) $z = x^3y^5 + 2x^4y + 3x^2 - 2y^3 + 10$

$$\frac{dz}{dx} = 3x^2y^5 + 8x^3y + 6x - 0 + 0 \quad \checkmark \quad ①$$

$$\frac{d^2z}{dx^2} = 6xy^5 + 24x^2y + 6 \quad \checkmark \quad ①$$

$$\frac{dz}{dy} = 5x^3y^4 + 2x^4 + 0 - 6y^2 + 0 \quad \checkmark \quad ①$$

$$\frac{d^2z}{dy^2} = 20x^3y^3 + 0 - 12y \quad \checkmark \quad ①$$

$$\frac{d^2z}{dydx} = 15x^2y^4 + 8x^3 \quad \checkmark \quad ①$$

$$\frac{d^2z}{dxdy} = 15x^2y^4 + 8x^3 \quad \checkmark \quad ①$$

e. $y = 5x - 1$ $y = 2x^2 - 2x + 5$

$$5x - 1 = 2x^2 - 2x + 5 \quad \checkmark \quad ①$$

$$2x^2 - 2x - 5x + 5 - 1 = 0$$

~~$$2x^2 - 2x - 5x + 5 - 1 = 0$$~~
$$2x^2 - 7x + 4 = 0$$

~~$$2x(x-1)$$~~

$$2x^2 - 8x + 4 + x + 4 = 0$$

$$\begin{array}{r} 2 \times 4 \\ 1 \times 8 \end{array}$$

$$2x(x-4)(x+4) = 0 \quad \times$$

$$2x+1=0 \text{ or } x+4=0$$

$$2x=-1 \text{ or } x=-4 \quad \times$$

$$x = -\frac{1}{2}$$

e).
continued.

$$\text{if } x = -\frac{1}{2}$$

$$\text{Then } y = 2\left(-\frac{1}{2}\right)^2 - 2\left(-\frac{1}{2}\right) + 5$$

$$y = 5.5$$

$$\text{if } x = -4$$

X

$$\text{Then } y = 2(-4)^2 - 2(-4) + 5$$

$$y = -19.$$